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| 10/524,215 | 02/10/2005 | Yasuhiko Kojima | 265769US26PCT | 6423 |
| 22850 | 7590 | 01/22/2008 OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314 | | |
| | | EXAMINER NARAYAN, PRATIVADI B | | |
| | | ART UNIT | PAPER NUMBER | 1792 |
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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| | | |
|------------------------------|----------------------------------|------------------|
| Office Action Summary | Application No. | Applicant(s) |
| | 10/524,215 | KOJIMA ET AL. |
| | Examiner Prativadi B. Narayan | Art Unit 1792 |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 23 October 2007.
- 2a) This action is FINAL. 2b) This action is non-final.
- 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) 6-11 is/are withdrawn from consideration.
- 5) Claim(s) _____ is/are allowed.
- 6) Claim(s) 1-5, 12-18 is/are rejected.
- 7) Claim(s) _____ is/are objected to.
- 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) The specification is objected to by the Examiner.
- 10) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 14 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention, because claim 14 is dependent on claim 14. In the present Office Action, the examiner assumed that claim 14 is dependent on claim 13.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

5. Amended Claims 1, 2, 4, 12, and 15 are rejected under USC 103 (a) as being unpatentable over Ryusuke et al. (Japanese Patent Publication No. 05-009740 with the publication date of Jan 19, 1993, hereafter '740), in view of Grosshart (U.S. Patent No. 5,948,283, with the publication date of Sep 7, 1999, hereafter, '283), Kobayashi et al. (U.S. Patent No. 5,470,451, with the publication date of Nov 28, 1995, hereafter, '451), Kim (U.S. Patent no. 5,983,998 with the publication date of Nov 16, 1999, hereafter '998) and Nguyen (U.S. Patent Application Publication No. 2002/0011216 A1, hereafter '216).

'740 teaches

For Amended claim 1:

A substrate processing apparatus comprising:

- a processing chamber (container 17 in Drawing 8 and [0004]) for accommodating a substrate (wafer 2 in Drawing 8 and [0004]) therein;
- a mounting table (ceramic base 3 in Drawing 8 and [0004]) for mounting the substrate thereon;
- a heating member (heating elements 4 and ceramic heater 1, as shown in Drawing 8 and [0004]) disposed in the mounting table, for heating the substrate;
- a sealing member (O-ring 12 in Drawing 8 and [0005]) disposed between the mounting table and the processing chamber.
- a cooling unit (water-cooled jacket 16 in Drawing 8 and [0005]), having a cooling medium (water), for cooling the sealing member by using a latent heat of vaporization of the cooling medium (the most prominent cooling mechanism of water) included therein.

For Amended claim 4:

- a processing gas supply system (gas supply hole 18 in Drawing 8 and [0004]) for supplying a processing gas into the processing chamber.

'740 does not specifically teach

- the sealing member is between the bottom of the support of the mounting table and a bottom portion of the processing chamber (for amended claim 1).
- the cooling unit includes an airtight casing for accommodating the cooling medium therein, the casing has a first-end portion and a second end portion, and the first end portion is configured to be inserted into an opening formed through the bottom portion of the processing chamber, wherein the cooling unit further includes a condenser accommodating therein the second end portion to thereby liquefy, in the second end portion, the cooling medium vaporized in the first end portion (for amended claim 1).

'451 (whose field of invention is related to a vapor deposition apparatus for stabilizing and improving film quality of a thin film deposited on a substrate., Col 1 lines 5-11) teaches that the substrate is kept with the face-down orientation during film deposition to prevent dust particles from falling down on the processing surface of the substrate, thereby reducing the contamination by the dust particles of the processing surface (Col 1 lines 16-32).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have turned the orientation of the process chamber in '740 (drawing 8) by 180° so that the wafer is face-down to have reduced the contamination by the dust particles of the processing surface. Such orientation makes the sealing member 12 as existing between the bottom of the support of the mounting table (case-attaching ring 25) and a bottom portion of the processing chamber (flange 15) (see Drawing 8 of '740) (for part of the amended claim 1).

'283 (whose field of invention is cooling substrates in plasma-related semiconductor manufacturing Col 1 lines 6-9, Col 2 lines 22-26 and Col 2 lines 44-48) teaches the use of refrigeration sources for achieving steady-state thermal environment (Col 2 lines 4-21

and Col 6 lines 14-36). '998 (whose field of invention relates to cooling systems Col 1 lines 10-15) teaches the well-known details of refrigeration such as the cooling unit (Fig. 1) including an airtight casing (tubing from 4 through 7' through 8' to compressor 2 allows flow of refrigerant without a pressure loss, see Fig. 1 and Col line 16- Col 2 line 12) for accommodating the cooling medium (refrigerant in Col line 16- Col 2 line 12) therein, the casing has a first-end portion (evaporator 1 in Fig. 1 and Col line 16- Col 2 line 12) and a second end portion (condenser 3), wherein the cooling unit further includes a condenser (condenser 3 in Fig. 1 and Col 1 lines 16-27) accommodating therein the second end portion to thereby liquefy, in the second end portion, the cooling medium vaporized in the first end portion (evaporator 1 in Fig. 1 and Col 1 lines 16-27) in order to maintain optimum temperature conditions (Col 1 lines 10-15) (for amended claim 1).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used the cooling unit with the first and second end portions, and the condenser in the cooling unit of '740 to have achieved steady-state thermal environment for the substrates.

'216 (dealing with apparatus for use in the integrated circuit fabrication processes [0001]) teaches that the first end portion (entrance 14 in Fig. 1 and [0005]) of the cooling unit is configured to be inserted into an opening formed through the bottom portion of the processing chamber (Fig. 1) in order to cool side of the susceptor [0005].

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used the entrance of the cooling unit through the bottom portion of the processing chamber (Fig. 1) in order to cool side of the susceptor ([0005] of '216).

For Amended Claim 2:

'998 (whose field of invention relates to cooling systems Col 1 lines 10-15) teaches the well-known details of refrigeration e.g., depressurized refrigerant (tube 4 in Fig. 1 and Col 1 lines 16-27) for maintaining optimum temperature conditions (Col 1 lines 10-15) (for amended claim 2).

For New Claim 15:

'998 teaches the condenser includes a vessel for accommodating therein the second end portion (see smaller structures within condenser 3 in Fig. 1).

For Amended Claim 12:

'283 teaches the cooling medium is water (Col 5 lines 46-54 of '283).

6. Amended Claim 5 is rejected under USC 103 (a) as being unpatentable over '740, '283, '451, '998 and '216 in view of Otsuki (U.S. Patent Application Publication No. 2001/0003271 A1 with the publication date of Jun 14, 2001, hereafter '271).

The combination of '740 '283, '451, '998 and '216 meets all the limitations of amended claim 4, as described above.

'740 teaches the presence of a CVD gas supply (item 18 in drawing 8 and [0004]), but does not specifically teach the use of a plurality of gas supplies and gas supply controllers.

'271 (whose field of invention relates to a CVD apparatus for semiconductors (Abstract and [0002]), similar to '740) teaches the use of a plurality gas supplies (items 41-45 in Fig. 1 and [0051]) and gas supply controllers (mass flow controllers, items 52 in Fig 1 and [0051]) for supplying discharge gases alternately [0049].

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used a plurality of gas supplies and gas supply controllers in the apparatus of '740 to have had the ability of supplying discharge gases alternately.

7. Amended Claim 3 is rejected under USC 103 (a) as being unpatentable over '740, '283, '451 '998 and '216 in view of Kazama et al. (U.S. Patent No. 5,567,267 with the publication date of Oct 22, 1996, hereafter '267).

The combination of '740 '283, '451, '998 and '216 meets all the limitations of amended claim 1, as described above.

'740 teaches the presence of a thermocouple (item 21 in drawing 8 and [0006]) to measure the temperature of the area near the sealing member, but does not specifically teach the use of a cooling unit controller for controlling the cooling unit based on the measurement result of the temperature sensor (or, thermocouple).

'267 (whose field of invention relates to plasma etching apparatus in the semiconductor industry (Col 1 lines 7-13), similar to '740) teaches the use of a control system (CPU 40 in Fig.1 and Col 6 lines 29-41) that controls the temperature sensor (item 21 in Fig.1 and Col 5 lines 5-23) and the cooling unit (item 27 in Fig. 1 and Col 6 lines 29-41) for optimum usage of the refrigerant and susceptor temperature control (Col 7 lines 31-43).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used a cooling control system as taught by '267 in the

apparatus of '740 to have optimized the usage of the refrigerant and susceptor temperature control.

8. Amended Claim 18 is rejected under USC 103 (a) as being unpatentable over '740, '283, '451, '998, '216 and '267, in view of Nguyen (U.S. Patent Application Publication No. 2002/0011216 A1, hereafter '216).

The combination of '740 '283, '451, '998, '216 and '267 meets all the limitations of amended claim 3, as described above.

The combination of '740 '283, '451, '998, '216 and '267 does not specifically teach that the temperature sensor is configured to be inserted into an aperture formed in the bottom portion of the processing chamber near the sealing member.

'216 (dealing with apparatus for use in the integrated circuit fabrication processes [0001]) teaches measurement of wall temperature with an embedded thermocouple (Figs. 2 and 7 and [0060]) to protect the O-ring 516 by cooling mechanism (Fig. 7 and [0065]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used a wall temperature sensor such as a thermocouple in the apparatus of '740 in order to have protected the temperature-sensitive parts such as O-rings.

9. New claims 16 and 17 are rejected under USC 103 (a) as being unpatentable over Ryusuke et al. ('740), in view of Grosshart ('283), Kobayashi et al. ('451), Kim ('998), and Nguyen ('216) and further in view of Burger et al. (U.S. Patent No. 4,143,523, hereafter '523).

The combination of '740 '283, '451, '998 and '216 meets all the limitations of new claim 15, as described above.

The combination of '740 '283, '451, '998 and '216 does not specifically teach (1) a circulation line for circulating a coolant which liquefies the vaporized cooling medium in the second end portion is connected to the vessel and a coolant supply source (for new claim 16) and (2) a pump for pumping the coolant from the coolant supply source is installed on the circulation line (for new claim 17).

'523 (related to transfer of heat from a refrigerant, Col 1 lines 7-14) teaches (1) a circulation line (inlet line 101 in Fig. 6 and Col 8 lines 38-68) for circulating a coolant which liquefies the vaporized cooling medium in the second end portion is connected to the vessel and a coolant supply source (exchanger 98 in Fig. 6 and Col 8 lines 38-68) (for new claim 16) and (2) a pump (pump 102 in Fig. 6 and Col 8 lines 38-68) for pumping the coolant from the coolant supply source is installed on the circulation line (for new claim 17) in order to improve the thermo-dynamic effectiveness of the heat pump (Col 4 lines 27-31).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used a circulation line for circulating a coolant, a coolant supply source and a pump for pumping the coolant in order to have improved the thermo-dynamic effectiveness of the heat pump (Col 4 lines 27-31).

10. New claim 13 is rejected under USC 103 (a) as being unpatentable over Ryusuke et al. ('740), in view of Grosshart ('283), Kobayashi et al. ('451), Kim ('998) and Nguyen ('216) and further in view of Byrd (U.S. Patent No. 3,537,515, hereafter '515).

The combination of '740 '283, '451, '998 and '216 meets all the limitations of the amended claim 1, as described above.

The combination of '740 '283, '451, '998 and '216 does not specifically teach a wick for moving the first cooling medium liquefied in the second end portion to the first end portion by a capillary force (for new claim 13).

'515 (related to a liquid coolant cooling system Col 1 lines 14-16) teaches that a wick (wick 44) enables the condensed fluid (46) to return to the vaporizer (38) by means of capillary flow through the annular wick (44) (see Fig. 2 and Col 2 lines 53-64) in order to improve the liquid cooling system (Col 1 lines 44-46).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used a wick for the transfer of the coolant in order to have improved the liquid cooling system (Col 1 lines 44-46).

11. New claim 14 is rejected under USC 103 (a) as being unpatentable over Ryusuke et al. ('740), in view of Grosshart ('283), Kobayashi et al. ('451), Kim ('998), Nguyen ('216) and Byrd (U.S. Patent No. 3,537,515, hereafter '515). and further in view of Mundlinger et al. (U.S. Patent No. 5,453,641, hereafter '641).

The combination of '740 '283, '451, '998, '216 and '515 meets all the limitations of the new claim 13, as described above.

The combination of '740 '283, '451, '998, '216 and '515 does not specifically teach the wick is a wire net (for new claim 14).

'641 (related to cooling of microelectronic devices Col 1 lines 11-14) teaches that a wick can be a porous material such as sintered metal, ceramic, screens or webbing (see Col 1 lines 55-67) in order to provide system cooling (Col 1 lines 55-67).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have used a screen or webbing (wire net) for a wick in order to have provided system cooling (Col 1 lines 55-67).

Response to Arguments

Applicant's arguments filed 23 October 2007 have been fully considered but they are not found to be persuasive.

Applicant amended the only independent claim i.e., claim 1, added limitations in claim 2, withdrew claims 6-10, cancelled claim 11 and added new claims 12-18. Examiner enters and considers all the amendments introduced by the applicant.

Applicant amended the claim 1 and argued that Ryusuke et al. do not teach all the limitations introduced by the amendment. Examiner maintains that the combination of '740 '283, '451, '998 and '216 meets all the limitations of amended claim 1, as described above.

Applicant amended the independent claim1, added new limitations to claim 2, and argued that Ryusuke, Grosshart, Kim and Kazama did not meet all the limitations of the amended claims 1-3. Examiner maintains that that the combination of '740 '283, '451, '998 and '216 (in view of Kazama for claim 3) meets all the limitations of amended claims 1-3, as described above.

Applicant additionally argues that Kazama alone does not teach all the limitations of claim 3 because the temperature sensors 21 and 23 controlling the cooling unit are not placed near the sealing member 12. Examiner maintains that Ryusuke shows that the thermocouple was placed near the sealing member and a combination of '740 '283,

'451, '998 and '216, in view of Kazama, meets all the limitations of the amended claim 3.

Applicant amended the independent claim 1, and argued that Ryusuke and Otsuki do not teach all the limitations of claim 5. Examiner maintains that the combination of '740 '283, '451, '998 and '216, in view of Otsuki, meets all the limitations of amended claim 5, as described above.

New claims 12-18 are rejected, as discussed above.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, THIS ACTION IS MADE FINAL. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Prativadi B. Narayan whose telephone number is 571-270-1881. The examiner can normally be reached on MTh 8 AM to 6 PM ET.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Cleveland can be reached on 571-272-1418. The fax phone

number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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